DOCUMENT RESUME

ED 420 302 IR 018 923

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|---|---|
| AUTHOR | Kosakowski, John |
| TITLE | The Benefits of Information Technology. ERIC Digest. |
| INSTITUTION | ERIC Clearinghouse on Information and Technology, Syracuse, NY. |
| SPONS AGENCY | Office of Educational Research and Improvement (ED), Washington, DC. |
| REPORT NO | EDO-IR-98-04 |
| PUB DATE | 1998-06-00 |
| NOTE | 4p. |
| CONTRACT | RR93002009 |
| AVAILABLE FROM | ERIC Clearinghouse on Information and Technology, 4-194 Center for Science and Technology, Syracuse, NY 13244-4100 (free while supply lasts). |
| PUB TYPE | ERIC Publications (071) -- ERIC Digests in Full Text (073) |
| EDRS PRICE | MF01/PC01 Plus Postage. |
| DESCRIPTORS | *Computer Assisted Instruction; Computer Attitudes; *Computer Uses in Education; Educational Technology; Evaluation Methods; *Instructional Effectiveness; Online Systems; Program Implementation; Student Attitudes |
| IDENTIFIERS | ERIC Digests; *Technology Integration; *Technology Role |

ABSTRACT

To be effective, technology cannot exist in a vacuum, but must become part of the whole educational environment. New measures of evaluation are under development which would help to better define the role of technology in its wider context. This ERIC digest summarizes the observed benefits of technology implementation and addresses the importance of evaluating the effects of technology on learning. Discussion includes applications of technology to basic and advanced skills; effects of technology on student attitudes; online technologies; use of technology by teachers and administrators; factors that help technology succeed; and evaluation of the impact on technology. Contains 16 references. (AEF)

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# The Benefits of Information Technology
# ERIC Digest
# June 1998

**By:**

**John Kosakowski**

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IR018923

Clearinghouse on Information & Technology

ERIC DIGEST

June 1998

EDO-IR-98-04

# The Benefits of Information Technology

by John Kosakowski

More than three decades ago, computers and related information technologies were introduced to educators as educational tools. Today, there are computers of various descriptions in nearly all schools in the United States. Teachers, school administrators, government officials, and others faced with the costs involved in technology implementation must constantly evaluate the educational benefits of technology. Is there research or other evidence that indicates computers and advanced telecommunications are worthwhile investments for educators? This Digest summarizes the observed benefits of technology implementation. The importance of evaluating the effects of technology on learning is also addressed.

## Applications of Technology to Basic Skills

Using educational technology for drill and practice of basic skills can be highly effective according to a large body of data and a long history of use (Kulik, 1994). Students usually learn more, and learn more rapidly, in courses that use computer assisted instruction (CAI). This has been shown to be the case across all subject areas, from preschool to higher education, and in both regular and special education classes. Drill and practice is the most common application of CAI in elementary education, the military, and in adult educational settings. Fletcher, et al (1990) reports that in the military, where emphasis is on short and efficient training time, the use of CAI can cut training time by one third. In the military, CAI can also be more cost-effective than additional tutoring, reduced class size, or increased instruction time to attain equivalent educational gains.

## Applications of Technology to Advanced Skills

The application of educational technologies to instruction has progressed beyond the use of basic drill and practice software, and now includes the use of complex multimedia products and advanced networking technologies. Today, students use multimedia to learn interactively and work on class projects. They use the Internet to do research, engage in projects, and to communicate. The new technologies allow students to have more control over their own learning, to think analytically and critically, and to work collaboratively. This "constructivist" approach is one effort at educational reform made easier by technology, and perhaps even driven by it. Traditional lecture methods are often left behind as students collaborate and teachers facilitate. Students, who often know more about technology than the teacher are able to assist the teacher with the lesson. Since this type of instructional approach, and the technologies involved with it, are recent developments, it is hard to gauge their educational effects. Still, an increasing body of evidence as presented by Bialo and Sivin-Kachala (1996) for example, suggests positive results. The Apple Classrooms of Tomorrow (Dwyer, 1994), a 10-year project where students and teachers were each given two computers, one for school and one for home, illustrates some of the gains made in students' advanced skills. ACOT reports that students:

- Explored and represented information dynamically and in many forms
- Became socially aware and more confident
- Communicated effectively about complex processes
- Became independent learners and self-starters
- Worked well collaboratively
- Knew their areas of expertise and shared expertise spontaneously and
- Used technology routinely and appropriately.

Another effort called the Buddy Project (Indiana's Fourth Grade, 1990) supplied students with home computers and modem access to school. Positive effects included:

- An increase in writing skills
- Better understanding and broader view of math
- Ability to teach others, and
- Greater problem solving and critical thinking skills.

## Effects of Technology on Student Attitudes

Numerous studies over the years, summarized by Bialo and Sivin-Kachala (1996), report other benefits enjoyed by students who use technology. These benefits involve attitudes toward self and toward learning. The studies reveal that students feel more successful in school are more motivated to learn and have increased self confidence and self esteem when using CAI. This is particularly true when the technology allows the students to control their own learning. It's also true across a variety of subject areas, and is especially noteworthy when students are in at-risk groups (special education, students from inner-city or rural schools).

## On-Line Technologies

The Internet and advanced networking technologies are comparative newcomers to the classroom. Efforts such as Net Day and e-rate discounts enacted by the Telecommunications Act (Telecommunications Act, 1996) make it easier for many classrooms around the country to connect to the Internet. Although a large body of research on the effects of the Internet in the classroom does not yet exist, recent studies illustrate some observed positive effects. A study by the Center for Applied Special Technology (1996) shows significantly higher scores on measures of information management, communication, and presentation of ideas for experimental groups with on-line access than for control groups with no access. Also, students in the experimental group reported significantly increased use of computers in four different areas—gathering information, organizing and presenting information, doing multimedia projects, and obtaining help with basic skills.

## Use of Technology by Teachers and Administrators

Teachers and administrators use computer and information technologies to improve their roles in the educational process. Some examples include:

- Using computer tools to streamline record keeping and administrative tasks, thereby helping to free up time for instruction or professional development
- Decreasing isolation by using e-mail and the Internet to communicate with colleagues, parents, and the outside world, and

- Increasing professional development activities by taking distance education courses, accessing educational research, and accessing classroom materials such as lesson plans.

## Factors that Help Technology Succeed

Some of the observed benefits associated with educational technology have been reviewed above, but what are the factors that help technology succeed in bringing about these benefits? Glenna & Melmed (1996) and the Technology Counts analysis suggest the following factors observed in successful technology-rich schools:

- **Evidence of a detailed technology plan.**
  Such a plan should consider funding, installation and integration of equipment, ongoing management of the technology. The plan should also express a clear vision of the goals of the technology integration.
- **Teacher training and continuing education.**
  Teachers should know how to operate the technology and how to integrate it into the curriculum.
- **Support from administration.**
  Administrative support can come in the form of funding, or in restructuring schedules and physical space to reflect the new learning environment.
- **Support from the community.**
  Parents, businesses, and community members can use technology as a springboard to become more involved in the activities of neighborhood schools. All can help with wiring or technical support. Parents can use e-mail to facilitate communication with teachers and administrators. Businesses can use e-mail to help mentor students and help them prepare for the workplace.
- **Support from government.**
  Adequate funding and appropriate policy making can help to assure that technology is accessible to all schools on an equal basis.

These factors suggest that to succeed, technology, like any educational tool, cannot exist in isolation, but must be made an integral part of the entire instructional process.

## Evaluating the Impact of Technology

Traditional methods of evaluating the effectiveness of educational technology present a number of problematic issues. Glenna & Melmed (1996) state these succinctly:

- Most available tests do not reliably measure the outcomes being sought. The measures that are reported are usually from traditional multiple-choice tests. New measures need to be developed which would assess the higher-level skills and other effects often affected by technology
- Assessments of the impact of technology are really assessments of the instructional processes enabled by technology, and the outcomes are highly dependent on the quality of the implementation of the entire instructional process. Crucial elements include instructional design, content, and teaching strategies associated with both the software and the classroom environment
- The very dynamic nature of technology makes meaningful evaluation difficult. By the time long-term studies are completed, the technology being evaluated is often outdated.

The U.S. Department of Education and Educational Testing Service (ETS) report that new methods of evaluation that look at technology in context are being investigated. These methods will focus ideally not on the question "Does technology work?" but rather on how it impacts the various components of the educational process.

## Summary

Technology has been shown to have positive effects on the instructional process, on basic and advanced skills. Technology is also changing the instructional process itself. To be effective, technology cannot exist in a vacuum, but must become part of the whole educational environment. New measures of evaluation are under development which would help to better define the role of technology in its wider context.

## Bibliography and Further Reading


Bialo, E. R., & Sivin-Kachala, J. (1996). *The effectiveness of technology in schools: A summary of recent research.* Washington, DC: Software Publishers Association.

Birman, B. & others. (January, 1997). *The effectiveness of using technology in K-12 education: A preliminary framework and review,* Washington, DC: American Institutes for Research.

Center for Applied Special Technology. (1996). *The role of online communications in schools: A national study.* Peabody, MA: CAST. Internet WWW page, at URL: <http://www.cast.org/stsstudy.html> (version current at April 1998).

Dwyer, D. (April, 1994). Apple classrooms of tomorrow: What we've learned. *Educational Leadership, 51*(7), 4-10 . (EJ 508 281)

Education week on the web. *Technology Counts: Schools and reform in the information age. A special report.* Internet WWW page, at URL: <http://www.edweek.org/sreports/tc/> (version current at April 1998)

Fletcher, J.D., Hawley, D.E., & Piele, P.K. (1990). Costs, effects, and utility of microcomputer assisted instruction in the classroom. *American Educational Research Journal, 27,* 783-806.

Glenna, T. K. & Melmed, A. (1996). *Fostering the use of educational technology: Elements of a national strategy. A Rand Report.* Santa Monica, CA:Rand. Internet WWW page, at URL:<http://www.rand.org/publications/MR/MR682/contents.html>(version current at April 1998).

*Indiana's fourth grade project: Model applications of technology. Second Year, 1989-90.* (1990). Indiana State Dept. of Education. Indianapolis: Advanced Technology, Inc. (ED 343 550) Internet WWW page, at URL: <http://www.buddynet.net/> (version current at April 1998).

Krendl, K.A. & Clark, G. (Spring, 1994).The impact of computers on learning: Research on in-school and out-of-school settings. *Journal of Computing in Higher Education, 5*(2), 85-112 . (EJ 479 669)

Kulik, J.A. (1994). Meta-analytic studies of findings on computer-based instruction. In E.L. Baker and H.F. O'Neil, Jr. (Eds.), *Technology assessment in education and training.* Hillsdale, NJ: Lawrence Erlbaum.

Mann, D., & Shakeshaft, C. (1997). *The impact of technology in the schools of the Mohawk Regional Information Center Area. Technical Report.* Verona, NY:Mohawk Regional Information Center. (ED 405 893)

Poirot, J.L. & Knezek, G.A. (Nov, 1992). Experimental designs for determining the effectiveness of technology in education. *Computing Teacher, 20*(3), 8-9. (EJ 454 689)

Telecommunications Act of 1996. (1996). Congress of the U.S., Washington, DC. (ED 395 583)

Thompson, A.D., Simonson, M.R., & Hargrave, C.P. (1996). *Educational technology: A review of the research.* Second edition. Washington, DC: Association for Educational Communications and Technology.

U.S. Department of Education. (1996). *Getting America's students ready for the 21st century: Meeting the technology literacy challenge.* Washington, DC: U.S. Department of Education. Internet WWW page, at URL: <http://www.ed.gov/Technology/Plan/NatTechPlan/> (version current at April 1998).

U.S. Department of Education. *Using technology to support education reform.* Washington, DC: U.S. Department of Education. Internet WWW page, at URL: http://www.ed.gov/pubs/EdReformStudies/TechReforms/> (version current at April 1998).



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*This publication was prepared with funding from the Office of Educational Research and Improvement, U.S. Department of Education under contract no. RR93002009. The opinions expressed in this report do not necessarily reflect the positions of OERI or ED.*